

DOCUMENT RESUME

ED 302 194

IR 013 553

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TITLE The Microsoft Multimedia Encyclopedia.
PUB DATE Jun 86
NOTE 18p.; Paper presented at an Invitational Conference on Multimedia in Education (Cupertino, CA, June 19-20, 1986). For the complete journal, see IR 013 538.
PUB TYPE Journal Articles (080) -- Speeches/Conference Papers (150)
JOURNAL CIT Learning Tomorrow: Journal of the Apple Education Advisory Council; n3 p303-320 Spr 1987
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Animation; *Computer System Design; *Encyclopedias; Illustrations; *Information Retrieval; *Interactive Video; Microcomputers; *Videodisks
IDENTIFIERS *Hypermedia; *Multimedia Materials

ABSTRACT

A multimedia encyclopedia (MME) demonstration disk has been developed by the Microsoft Corporation, which contains five-page articles on 12 subjects. Each article contains text, images, audio, and in some cases, animation and full motion digital images. Each MME article is constructed as a network of linked text, image, and sound files. With mouse or keyboard control, the user can browse through an article, select audio descriptions or sound effects, images, cross-references to other articles, or supplementary text information, and a mouse click activates the playback and display routines. The MME provides three data-accessing methods, each designed to accommodate different learning styles: an outline search method called "PathKey"; a keyword search method call "WordKey"; and an alphabetically ordered index called the "Browser." Any data object may be associated with highlighted or colored area on the screen. These areas are called "buttons" or "hot keys," and are activated when selected with the mouse. By providing links to multiple levels of information using different media, this hypermedia system is able to accommodate a much broader audience than a static two-dimensional information system. Examples of screens from the MME system are presented in 17 figures. (EW)

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The Microsoft Multimedia Encyclopedia

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IR 013 553

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Late in 1985, Microsoft Corporation began work on a demonstration of CD ROM technology that fully integrated digital audio, graphics, and text on a single optical disc. Microsoft chose a multimedia encyclopedia as the vehicle to demonstrate the full capacity of CD ROM. The result of three month's development, it was introduced at Microsoft's 1st Annual CD ROM Conference in 1986. The demonstration consisted of 11 articles containing text, graphics, sound, a motion sequence, and some animation, all stored digitally on the CD ROM disc and played back through an IBM AT computer.

This multimedia encyclopedia (MME) demonstration represents one of the most elegant examples of a digital multimedia application. (In 1986 it underwent some upgrades, incorporating a richer selection of audio information and more elaborate structured graphics, animation, and visual effects.) This paper describes the basic design features and functionality of the demonstration disc. Even though the MME is a demonstration, it continues to serve as a tantalizing model of things to come.

What is CD ROM?

CD ROM (Compact Disc Read-Only Memory) is a digital data-distribution medium that uses laser optic technology to record and read any kind of digital information—including text, images, and digital audio. Because of its large capacity (550 megabytes) and low cost (mastering cost of \$5,000 and incremental pressing cost of \$5 per disc), CD ROM currently provides the most cost-effective distribution method for digital data.

CD ROM is adapted from the compact audion disc, and therefore enjoys enormous cost economics of scale. The CD ROM standard format is supported by an existing infrastructure of mastering and pressing facilities worldwide. Compared to other data storage media, CD ROM offers dramatic advantages in data density, pocket-sized convenience (a CD ROM disc measures 4.75 inches in diameter), and durability characteristics that are likely to stand up to the rigors of the home market.

As with any new technology, CD ROM has some performance limitations. The most important of these limitations are its slow access-time (200—10,000 milliseconds per seek) and fixed data-transfer rate of 150 kilobytes per second. However, these performance characteristics are more than acceptable by today's standards, especially if designers pay close attention to program design and data indexing. By using special data-caching techniques, a selection from a large data base can be retrieved and displayed in two seconds or less—a rate as good as or better than on-line or network performance.

With RCA's recent announcement of Digital Video Interactive (DVI), it is now also possible to store one hour of full-motion digital video on CD ROM—long thought unattainable because of CD ROM's limited transfer rate. (DVI is a semiconductor technology that skirts the data transfer rate limitations of CD ROM, and any other digital media, through the use of two high-speed video processor chips. For more information, contact RCA Labs, Princeton, NJ 08540)

MME: A General Description

The MME demonstration consists of 12 five-page articles on the following subjects:

Apollo Moon Landing
Ludwig van Beethoven
CAT Scan Technology
DNA
Football
1984 Olympics

Japanese Art
Jet Airplanes
John F. Kennedy
Battle of Gettysburg
Space Shuttle
Whales

The subjects were chosen because they lend themselves easily to audiovisual elements that are possible in a CD ROM environment. Each article contains text, images, audio, and, in some cases, animation and full motion digital images.

Operating Environment

The MME demonstration runs in concert with Microsoft Windows, taking advantage of certain selected features available in the Windows graphics environment. It operates on an IBM AT computer under MS-DOS 3.1, and requires the following hardware to operate the CD ROM drive, play back digital audio, and display high-quality, full-color images:

IBM AT with 640K RAM and a 20MB hard disk
AST Advantage memory-expansion board
CD ROM drive with audio output (and drive controller board)
Mouse (and mouse controller board)
EGA board and display
AT & T Targa 16 board for displaying full-color images
Intel Above Board AT (with 2MB RAM)
RGB analog monitor (for Targa 16 output)
EGA/RGB conversion board (to produce RGB analog output from EGA display adapter)

Article Structure

Each MME article is constructed as a network of linked text, image, and sound files. With mouse or keyboard control, the user can browse through an article, select audio descriptions or sound effects, images, cross-references to other articles, or supplementary text information and a mouse click activates the playback and display routines.

Accessing Methods

The MME provides three data-accessing methods, each designed to accommodate different learning styles: an outline search method called *PathKey*; a keyword search method called *WordKey*; and an alphabetically ordered index called the *Browser*. The user selects an access method from the control menu option on the Windows menu bar.

PathKey:

The most popular accessing method, *PathKey* uses a hierarchically ordered subject index. The highest index level contains an alphabetical listing of the general subjects available in a hypothetical encyclopedia—only some of which are active in the demonstration. The second index level contains an alphabetical listing of the topics within a particular subject area. The third index level contains subtopics related to the main topic. The access methodology is shown in Figures 1-7 which follow these brief descriptions.

WordKey:

Articles can also be accessed by searching for specific words within the text of every article. When the retrieval software finds a word match, it constructs a listing of every article that contains an occurrence of the requested words. The user then selects an article from this list.

Only partially activated in this demonstration, the *WordKey* access option simulates full-text Boolean search and retrieval in two entry modes: advanced mode and command mode. The *advanced mode* presents an array of selection menus that allow the novice user to enter the sought-after word or words without having to understand Boolean search terminology. This search procedure is shown in Figures 8-13. The *command mode* allows a user familiar with Boolean search syntax to directly enter the search criteria by using standard Boolean terminology. For example, to produce the same search result shown in Figures 8-13, a *command mode* user would enter this search string:

FIND *Japanese* AND *war* OR *art* BUT NOT *modern*

This search string would find all articles containing the words *Japanese*, *war*, or *art*, but would not retrieve the articles that also contained the word *modern*.

Browser:

A third accessing method available in the MME demonstration is an alphabetically ordered hierarchical index that operates in much the same way as the *PathKey* subject index—as a sequence of nested indexes. The *Browser* was included as an access method to mimic the alphabetical structure and access methodology used by readers of printed encyclopedias. In an electronic environment, however, when compared to either the *PathKey* or *WordKey* accessing methods, the *Browser* method (shown in Figures 14-17) is not as useful or efficient.

Method of Linking Data Types:

Any data object—be it an ASCII text file, a picture, or a narration—may be associated with a highlighted or colored area on the screen. These areas are called *buttons*, or *hot keys*, and are activated when selected with a mouse. Activating a button causes the access program to branch to audio, images, or additional text information. The supplementary text information may include *cross-references* to other articles, *notes* about a particular subject (see Figure 16), or a glossary definition.

Of all its features, the MME's *hot key* concept offers perhaps the most exciting potential. By providing links to multiple levels of information using different media such an information system is able to accommodate a much broader audience than a static, two-dimensional information system (such as a printed page, or a word-processing document can). Images, sound, and text can be combined in such a way that they effect learning, providing users with the ability to control the amount and type of information they desire.

Often called "hypertext" or "hypermedia," this method of presenting information is ideally suited to an electronic environment. It allows an endless variety of links to be embedded—supplementary data as well as information that is outside the current article or subject area. A child and an adult could each conceivably browse the same material and extract information appropriate for his or her level of understanding without being overwhelmed or disappointed by its content.

Conclusion

Because of the MME demonstration's wide appeal, and proven ability to effectively demonstrate the potential of digital optical media for conveying multimedia information, the MME has served well as a model for future interactive products and authoring tools currently under development at Microsoft. Most viewers are easily excited by the combination of audio, images, and text in an interactive environment. The challenge will be to determine which accessing and authoring methods are most efficient and provide the best possible environment for the user and developer.

Figure 1.
In a Windows environment,
the menu bar at the top of
the screen indicates the
command options available to
the user. Only certain
command options are
activated in the MME
demonstration program.

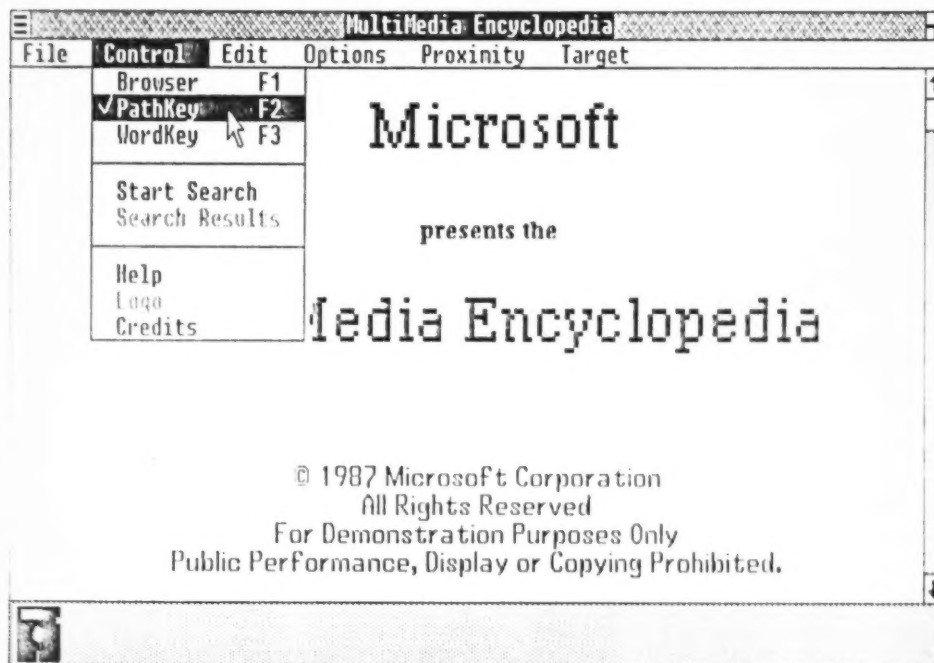


Figure 2.
PathKey is an outlining search
method. When you select this
accessing method, the system
presents a hierarchically
ordered subject index of the
encyclopedia contents.

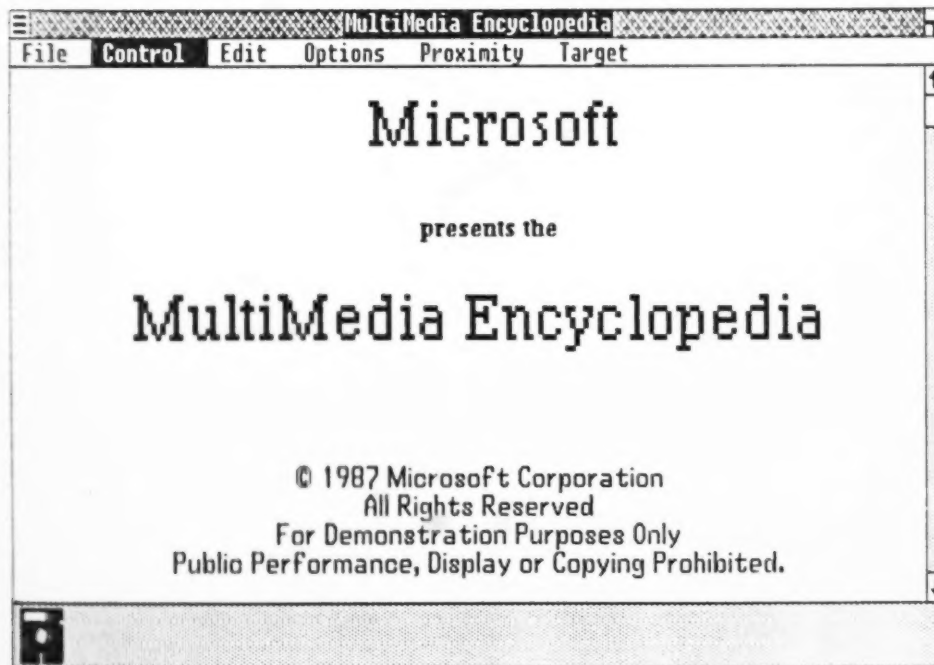


Figure 3.
The highest level of the index contains general subject areas, arranged alphabetically.

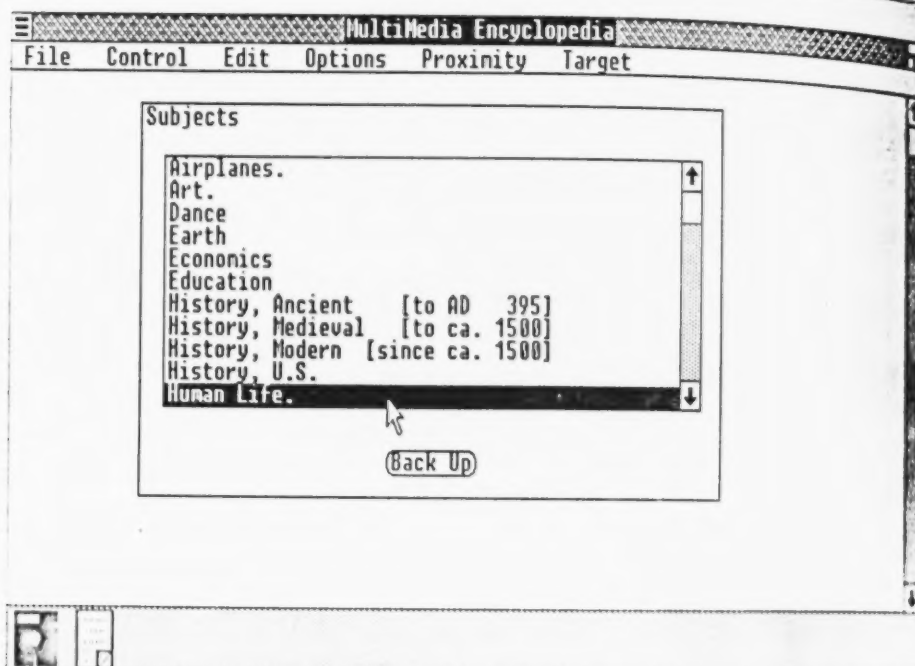


Figure 4.
The second level contains an alphabetical listing of the major topics within the main subject category—in this example, Human Life.

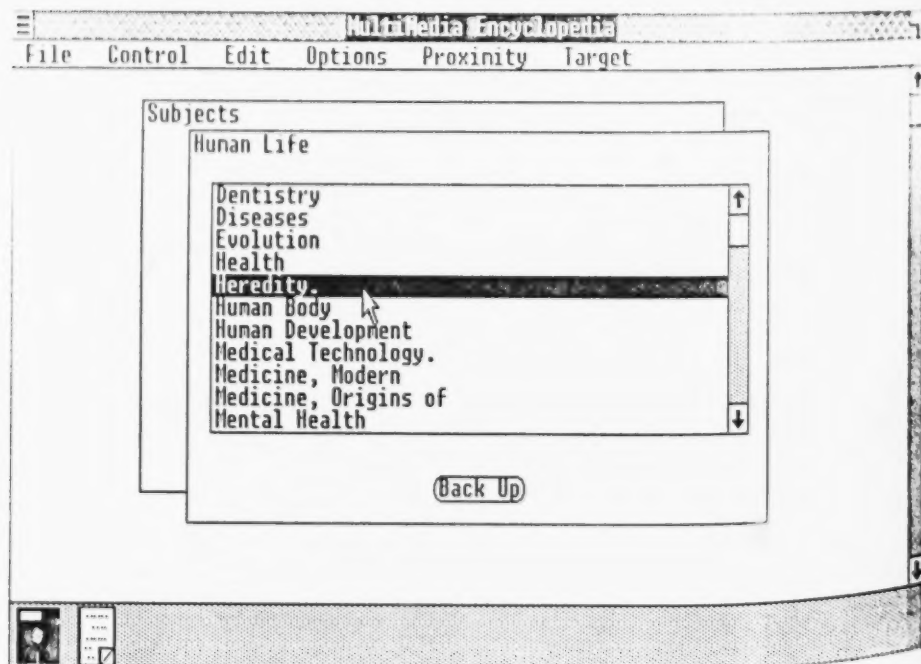


Figure 5.
The third and final level of the hierarchical index contains an alphabetical listing of the specific subtopics within the major topic category—in this example, the major topic is Heredity and the subtopic is DNA.

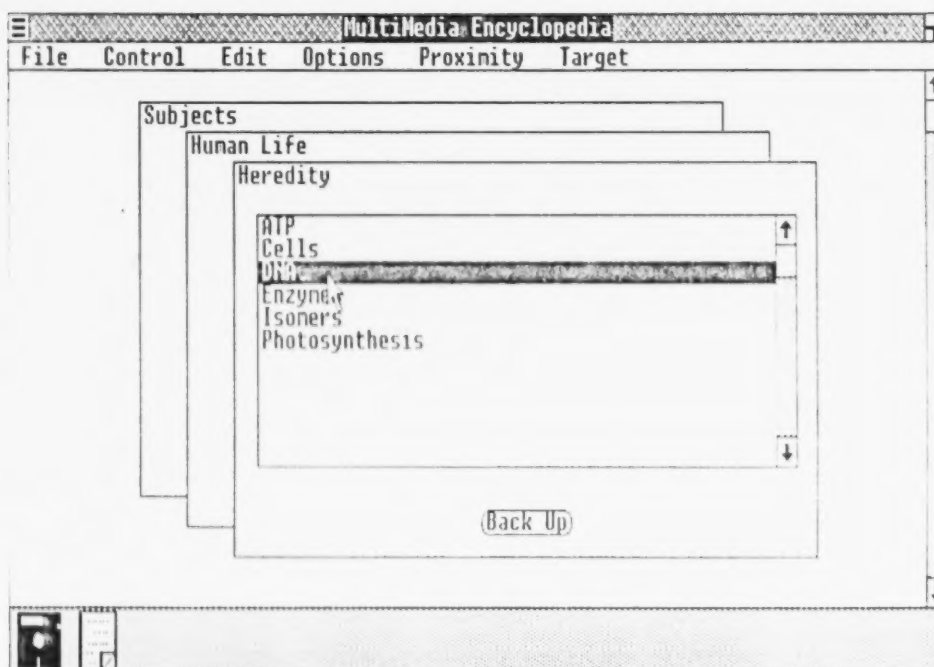


Figure 6.
A mouse click on the entry labeled DNA calls up an article on the subject. The word DNA is a "hot key" which indicates the presence of an associated image or audio clip. When the user clicks on a hot key, the additional information will appear on the screen. See Figure 7.

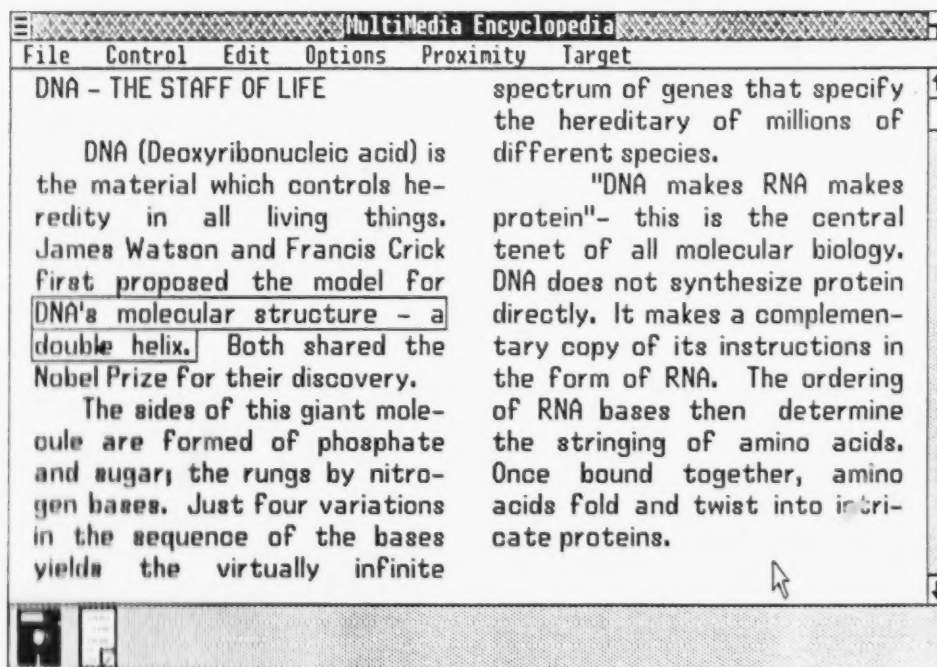


Figure 7.

(35mm slide image of DNA molecule.) The DNA molecule shown in this figure spins in full motion in the live demonstration. Full motion is accomplished by storing 32 separate single-frame images of the rotating molecule, and displaying them on the screen at the rate of 32 frames per second.

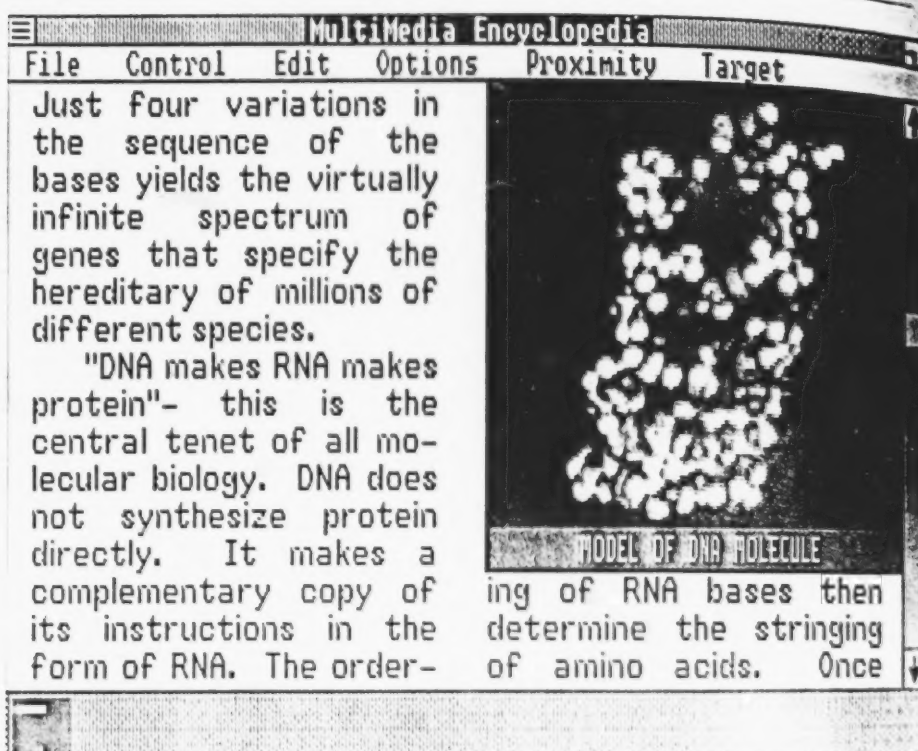


Figure 8.

The WordKey accessing method simulates full text Boolean search and retrieval.

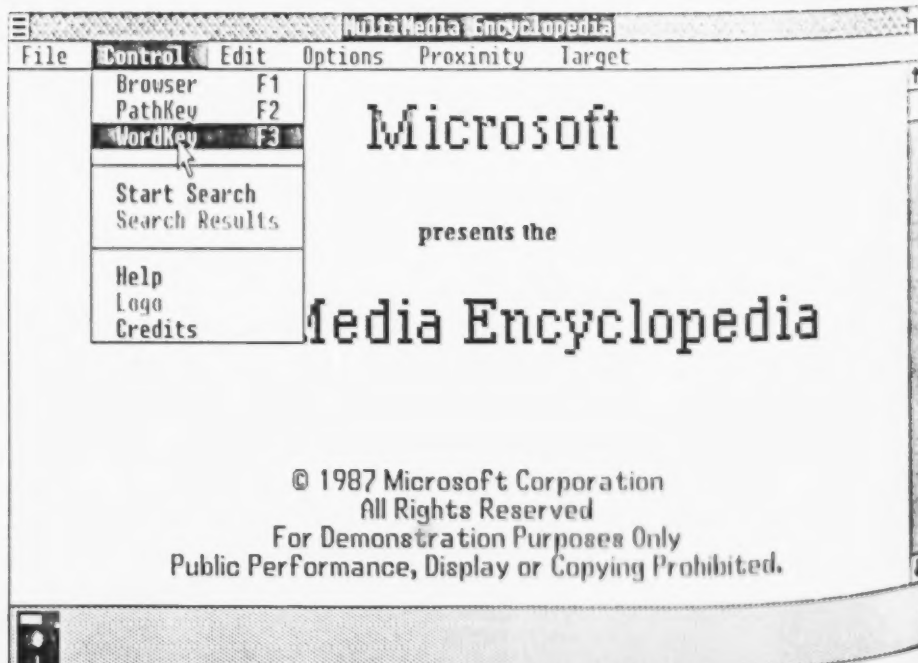


Figure 9. For novice users, the WordKey option displays an array of selection menus that feature a built-in AND/OR/NOT Boolean filter.

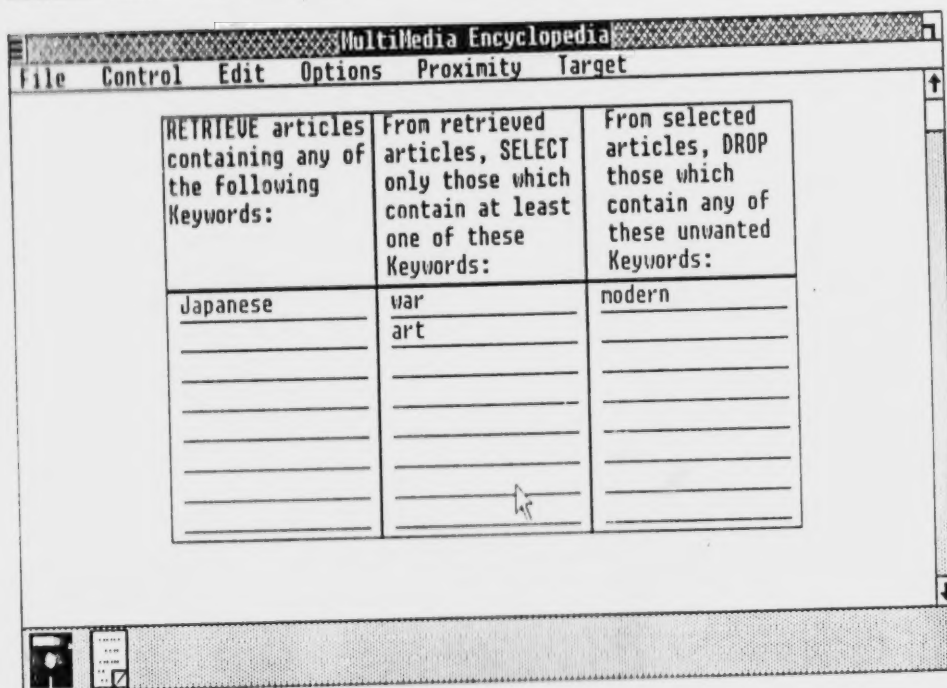


Figure 10. To activate a search, the user must pull down the Control menu and click on the START SEARCH option. When the system has found all occurrences of the selected words, the user must select the SEARCH RESULTS option.

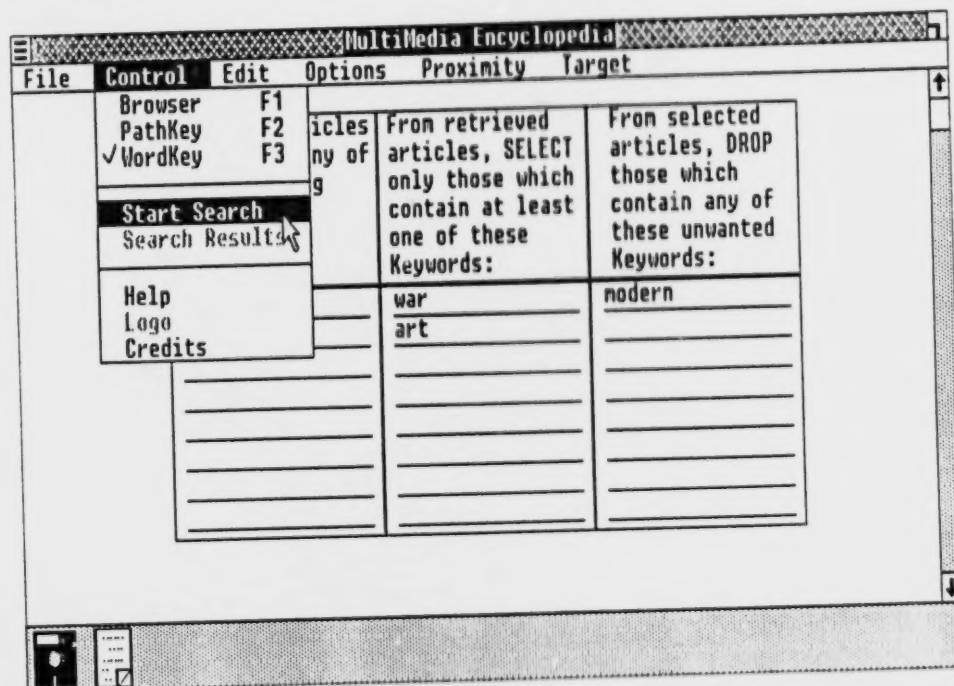


Figure 11.
When the search is complete,
a window appears that
displays the articles that
match the selection criteria.

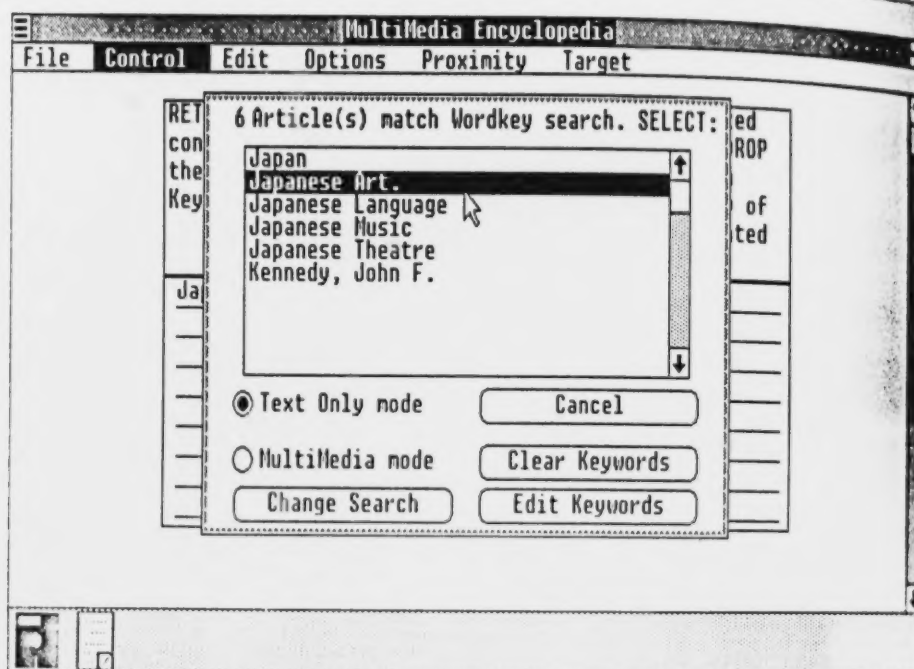


Figure 12.
Upon selecting Japanese Art
from the list of articles, the
image, sound, and text data,
is transferred to computer
memory from the CD ROM
disc. The boxed words
indicate the presence of the
image showing in Figure 13.

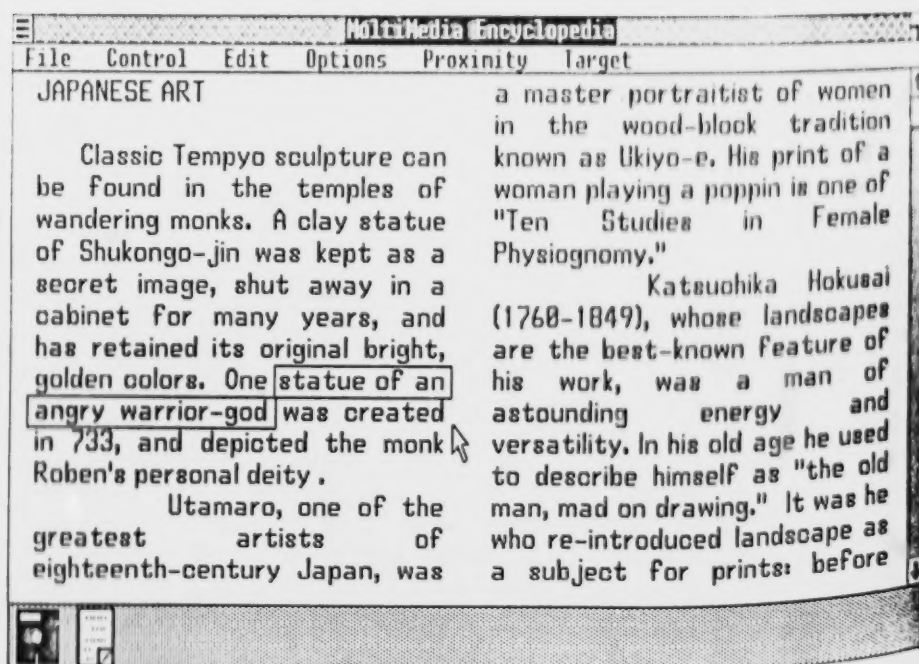


Figure 13.
The image associated
with a hot key and
activated by a mouse

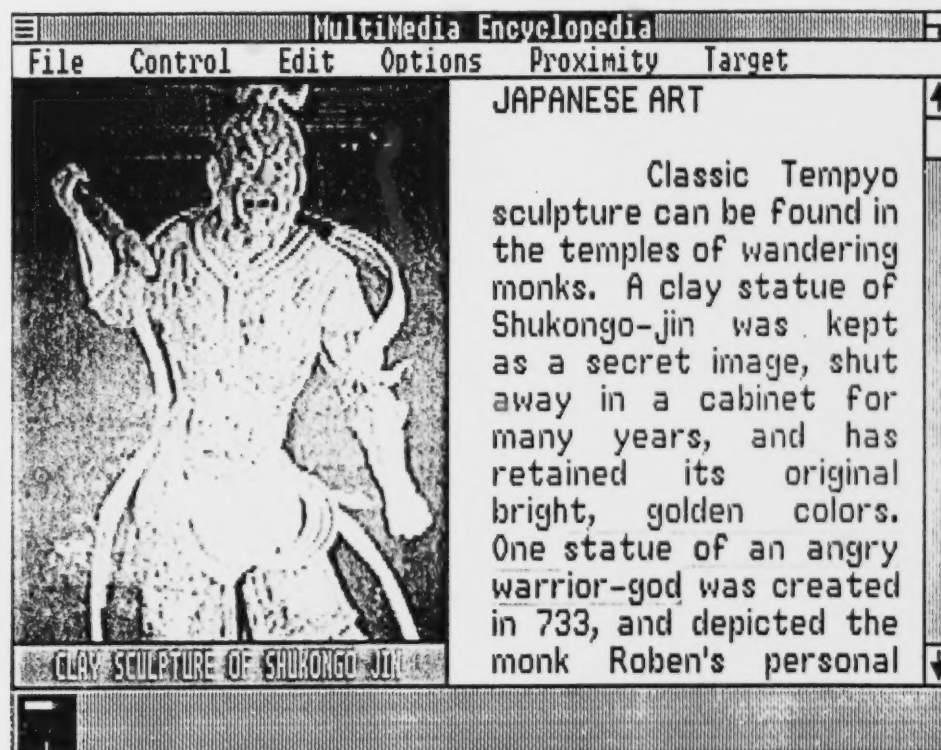


Figure 14. The Browser index
allows the user to choose the
specific article by selecting
from a series of alphabetical
indexes.

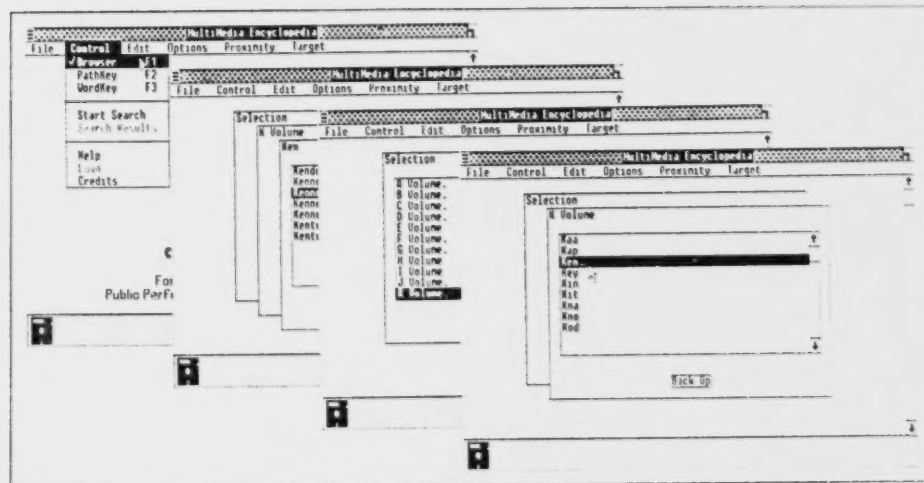


Figure 15. The first page of an article on John F. Kennedy reveals two buttons or hot keys.

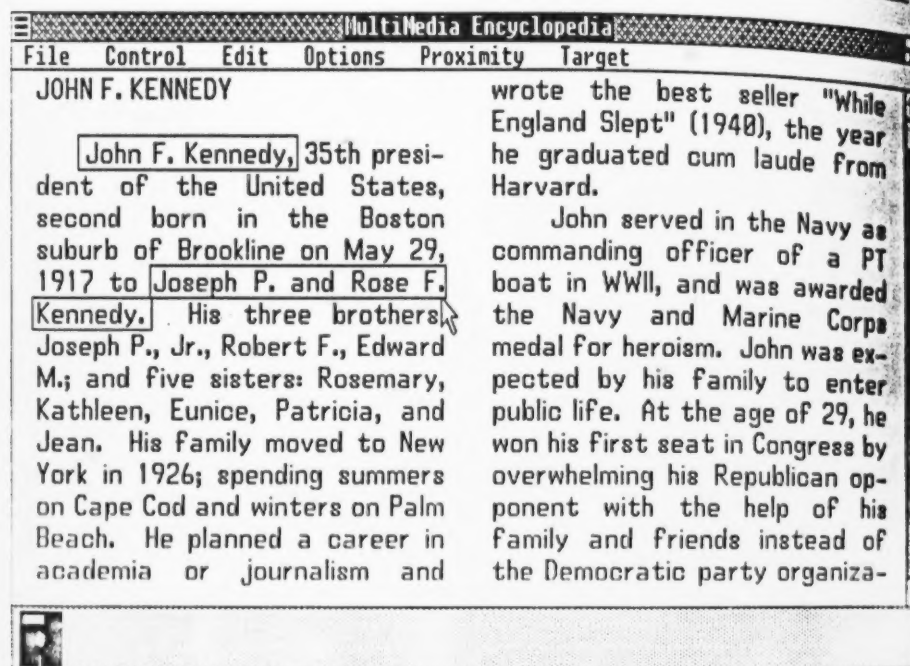


Figure 16. A mouse click on the button containing the words Joseph P. and Rose F. Kennedy, calls up a window of additional information on the Kennedy family. By clicking on the box containing OK, the window disappears and the original display returns.

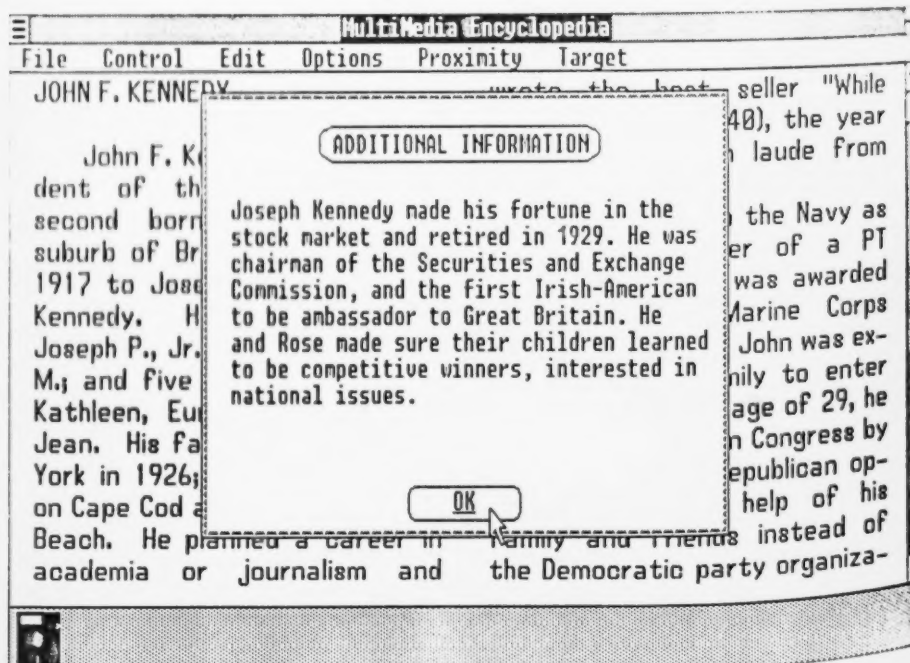
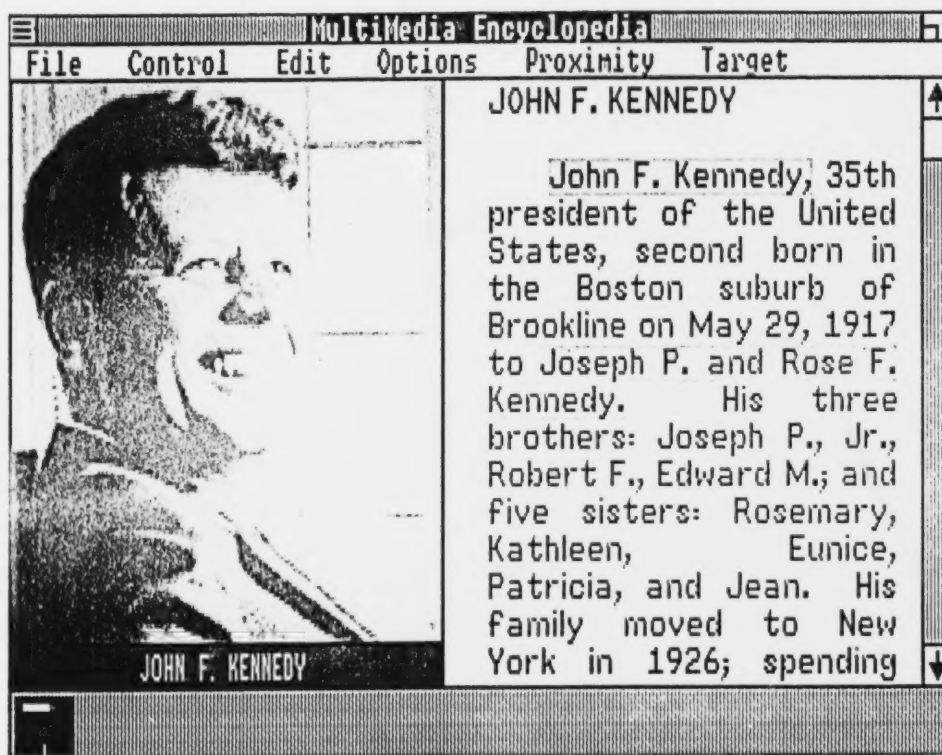


Figure 17. A mouse click on the button containing the words John F. Kennedy reveals a picture of JFK in full color and video-quality resolution. In some cases an image button may also have audio associated with it. One button in the JFK article generates a montage of 30 images while playing Kennedy's inaugural address in the background.





Suzanne Ropiequet

*Suzanne Ropiequet started her career at Tek only and later became one of the first employees of Dllithium Press, an early microcomputer book publisher. In addition, she has conducted classes in software applications training, written technical documentation, and been a designer and consultant in the field of interactive video technology. Suzanne is the editor of the best-selling book *The Peter Norton Programmer's Guide to the IBM PC*, as well as *CD ROM: The New Papyrus* and *CD ROM: Optical Publishing*, all published by Microsoft Press. She is also founder and president of the Northwest Chapter of the International Interactive Communications Society (IICS), a trade association that specializes in optical-disc technology.*